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PSYCHOMETRIC PROPERTIES OF THE DEMOGRAPHICS, TEMPERAMENT, AND
COPING SCALES (DTCS)

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14. ABSTRACT
Due to dramatic war time increases in prevalence rates, Combat and Operational S tress (COS) and its potential resultants (ranging from Combat and Opera tional Stress Reactions - COSRs to Post Traumatic Stress Disorder - PTSD) are topics of specific interest to the Department of Defense (DoD). Three ind ividual difference factors: demographics, temperament and coping style, show con sistent patterns as risk factors in PTSD development, and thus merit inclusion i n development of a pre-deployment Combat Stress Control (CSC) services scr eening instrument. This report presents data on the initial validation of these factors, which are individually assessed in the Demographics, Temperament, and C oping Scales (DTCS). The goal of the DTCS is to improve current methods us ed to identify individuals who would benefit from early COS intervention and mit igation. The study consisted of two samples. Fifty-four Aviation Preflight Indoc trination (API) trainees voluntarily participated in Sample One, and fifty-eight API trainees voluntarily participated in Sample Two. Each sample completed the DTCS and then a nomologically-related, established scale from which we could calculate theoretical convergent validity of the DTCS. In Sample One, participants completed the Revised Neuroticism-Extraversion-Openness Inventory (NEO-PI-R), focusing on the neuroticism facet, and the DTCS, focusing on the Temperament facet. In Sample Two, participants completed the Compass of Shame Scale (CoSS), focusing on the coping facet, and the DTCS, focusing on the coping facet. The study protocol was approved by the Naval Aerospace Medical Research Laboratory Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects. Psychometric analyses were performed on data drawn from the two study samples. Our results present a mixed picture for inferring the nomological network, and therefore application, of the DTCS. The reliability of the DTCS was low, restricting its maximum observed relationship with existing scales, and therefore limiting any potential convergent validation. The Demographics and Temperament composite scores of the DTCS did not show consistent relationships with the NEO-PI-R factors or with either coping subscore. This is particularly relevant considering that the theory driving the temperament component construction is predicated on the NEO-PI-R neuroticism factor. This may suggest that the DTC Scale is capturing something distinct from trait neuroticism and that additional validation is needed to explore relationships with other constructs and performance criteria. Additional convergent and divergent validation with larger samples is needed to verify and expand upon these initial results. Use of the DTCS in its current form is not recommended, though the potential impact of an instrument of this type warrants further investigation.

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Executive Summary

Due to dramatic war time increases in Combat and Operational Stress Reactions (COSR) prevalence rates, understanding, predicting, and treating COSR and related disorders is of great interest to the Department of Defense (DoD). Three individual differences factors - demographics, temperament, and coping style - show consistent patterns as risk factors for the development of mental health problems during or after operational deployments, and thus merit inclusion in development of a pre-deployment Combat Stress Control (CSC) services screening instrument. This report presents data on the initial validation of these factors, which are individually assessed in the Demographics, Temperament, and Coping Scales (DTCS). The goal of the DTCS is to improve methods used to identify individuals who would benefit from early COSR intervention and mitigation. The study included two separate participant samples comprised, respectively, of fifty-four and fifty-eight Aviation Preflight Indoctrination (API) student volunteers. To evaluate convergent validity of the DTCS, each sample completed both the DTCS and a nomologically-related, established instrument. In sample one, participants completed the DTCS, focusing on the Temperament component (a putative measure of neuroticism), and the NEO-PI-R, focusing on trait neuroticism. In sample two, participants completed the DTCS, focusing on its Coping component, and the Compass of Shame Scale (CoSS), a measure of coping styles.

Psychometric analyses were performed on data drawn from the two study samples. Our results present a mixed picture for inferring the nomological network, and therefore application, of the DTCS. The reliabilities of many components of the DTCS were poor, therefore restricting their potential convergent validity. The Demographics and Temperament component scores of the DTCS did not show consistent relationships with relevant NEO-PI-R factors or with coping scales. This is particularly noteworthy considering the DTCS Temperament component's intended use as a measure of neuroticism. This may suggest that the Temperament component of DTCS is capturing something distinct from neuroticism and that additional validation is needed to explore relationships with other constructs and performance criteria. Additional convergent validation with larger samples is needed to verify these initial results. Use of the DTCS in its current form is not recommended, though the potential impact of an instrument of this type warrants further investigation.

Introduction

Due to dramatic war time increases in prevalence rates, Combat and Operational Stress (COS) and its potential adverse psychological consequences (ranging from Combat and Operational Stress Reactions – COSRs to Post-Traumatic Stress Disorder – PTSD) are topics of specific interest to the Department of Defense (DoD). DoD Directive 6490.5, section 4, paragraph 1 states, in part, that "It is DoD policy that CSC (Combat Stress Control) policies and programs shall be implemented throughout the Department of Defense… to prevent or minimize adverse effects of Combat [and Operational] Stress Reactions (C[O]SRs)" (2003). This direction is warranted, as COS spans a wide array of military operations, and is therefore a common experience for service members. Unchecked COSRs can lead to COSR casualties, attrition, and personal suffering in the form of long-term clinical disorders. Data from Post-Deployment Health Assessments (PDHA) indicate 20% of Marines (N = 815) and 18% of Army (N = 894) personnel screened positive for PTSD following deployment to Iraq (Hoge et al., 2006a), and 12% of Army personnel (N = 1962) screened positive for PTSD after Afghanistan deployments. These data suggest room for improvement of the COSR mitigation process. Early identification and treatment of COS may prevent development of long-term clinical disorders such as COSRs and PTSD. Recent studies suggest that primary risk factors for COS development include three individual differences factors: demographics, temperament, and coping style. These three factors provided the basis for construction of the Demographics, Temperament, and Coping Scales (DTCS), the intended use of which is to assist in identification of individuals who would benefit from early COS mitigation. This report will present data concerning convergent validity and other psychometric properties of the DTCS.

Combat and Operational Stress Reactions

COSRS are the "***expected***, predictable, emotional, intellectual, physical, and/or behavioral reactions of service members who have been exposed to stressful events in combat or military operations other than war (emphasis added)" (Department of Defense Directive 6490.5, 2003; p. 8). Campise, Geller, and Campise (2006) note that indications of COSR can be adaptive (such as increased unit cohesion) or include misconduct manifestations (such as alcohol and drug abuse). Further, there are no strict guidelines for the recognition of COSR; rather, recognition is a "function of the duration, frequency, and intensity of the symptoms" (Campise et al., 2006.) and therefore involves knowledge of an individual's baseline behavior and social functioning.

Standard management of COSRs follows the *B*revity, *I*mmediacy, *C*entrality, *E*xpectancy, *P*roximity, and *S*implicity or *BICEPS* guideline (Morgan, 1993). In short, BICEPS dictates that treatment should 1) occur within 12 – 72 hours of COSR recognition, 2) take place close to the unit but away from the wounded, 3) be based upon simple interventions such as rest, hygiene, food, etc., and 4) emphasize the expectation of quick, positive recovery and return to duty. The BICEPS approach is effective – Campise et al. (2006) cite the U.S. Department of the Army (1994a; 2000) as reporting that "85% of [individuals recognized as having COSR] will respond to rest and return to duty within 3 days" (p. 225). Regardless of the short-term effects of treatment in theater, the potential for long-term disorder as a result of COSR still exists, specifically in the form of PTSD.

Post-traumatic Stress Disorder

In contrast to COSR, PTSD is a syndrome that must meet strict diagnostic criteria as specified in the American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) (APA, 1994). In summary, there must be exposure to a traumatic event and reaction including intense fear, helplessness and/or horror. The traumatic event can involve experiencing, witnessing, or being confronted with actual or threatened harm to the physical integrity of self or others. Post-exposure there are three categories of symptoms: 1) recurrent, intrusive re-experience of the trauma (such as memories of the trauma - images, thoughts, feelings, or distressing dreams), 2) avoidance of trauma-related activities, people, and places along with emotional numbing (such as difficulty experiencing happiness or love) and 3) persistent increased arousal (such as hypervigilance, trouble sleeping or concentrating.) Finally, these symptoms must endure for more than one month and cause impairment of day-to-day functioning.

Once a PTSD diagnosis is made, treatments include pharmacological (e.g., anti-depressant and anxiolytic medications) or non-pharmacological (e.g., cognitive-behavioral therapy, support groups) approaches, often with a combination of the two proving most successful (Davidson & Foa, 1992). PTSD treatment is often long, difficult, and costly with estimates of combined direct medical care, lost productivity, and suicide costs as high as $6.2 billion in the two years following deployment (Tanielian & Jaycox, 2008).

Critical Incident Stress Debriefing. Through review of the literature, it becomes apparent that exposure to COS is common for service members, and that COS can lead to COSR. Although COSR is usually treated with a high level of success, unsuccessfully treated or untreated COSR can lead to long term negative outcomes. Current efforts in pursuit of COS mitigation include actions to prevent, identify, and manage adverse COSRs, such as simulation of stressful situations during training, training and preparation, and structured stress debriefings (i.e., Critical Incident Stress Debriefing: CISD) immediately following exposure to trauma.

CISD is a form of psychological debriefing intended to allow participants to work through their experience of, and reaction to, a traumatic event in a psychosocially supportive environment (McNally, Bryant, & Ehlers, 2003). CISD has 5 key features:
1) multiple 3 – 4 hour sessions conducted in close relation to the traumatic event
2) usually takes place in groups
3) run by a facilitator who takes the group through seven phases
4) seven phases are designed to allow individual and group level expression of the experience while offering expert advice on coping strategies as well as general group support
5) intended outcome within this framework is "to mitigate the adverse psychological consequences of traumatic events by attenuating the intensity of acute symptoms of stress, thereby reducing the risk of subsequent psychiatric problems" (McNally et al., 2003, p. 56).
The *BICEPS* approach described previously is a variation on the CISD technique.

Despite CISD's popularity and wide implementation, there remains some debate over the efficacy of CISD (McNally et al., 2003). This is due in part to difficulty identifying individuals

for whom the CISD technique will be most useful, as considerable individual differences exist in reactions to COS and CSC (Lewis, 2006). In light of this difficulty, an instrument that facilitates efficient and timely identification of individuals who may require, or who may respond positively to, existing services after exposure to trauma would have immediate utility. A short paper and pencil instrument would be highly portable, easily administered, and cost effective, allowing better utilization of existing resources.

Similar individual susceptibility questions arise when attempting to identify persons most vulnerable to development of PTSD. Prevention of PTSD development is imperative on individual, operational, and economic levels. Identification of individuals susceptible to PTSD development is the first step in prevention, so that current services can be effectively applied. Although standard DoD management of traumatic incidents includes simple intervention (i.e., rest, food and hygiene following the *BICEPS* guidelines) and psychological counseling in a group setting (i.e., CISD), there is a lack of assessment of individual factors that may influence treatment outcomes, such as those that indicate predisposition to risk of developing PTSD. Because previous research has shown three individual differences factors (i.e., demographics, temperament, and coping styles) that display consistent patterns as risk factors in PTSD development, these factors have been included in the development of a pre-deployment CSC services screening instrument: the DTCS. Inclusion of a screening instrument that includes assessments of these individual factors may help determine the most appropriate intervention for each individual experiencing negative effects of COS.

A recent meta-analysis conducted by McNally et al. (2003) provides a comprehensive overview of individual difference risk factors for the development of PTSD. These factors can be broken down according to time frame (Risk of Exposure, Post-Exposure: Retrospective, Prospective, Peritraumatic) and, for the purposes of this report, by risk factor type (Demographic, Temperament and Coping style). The time frame by risk factor type categorization is represented in Table 1. The following is a detailed review of each individual difference risk factor type.

Demographic Risk Factors. A review of current meta-analyses indicates the most consistent demographic risk factors for the development of PTSD involve aspects of: 1) gender, 2) education, 3) socioeconomic status, 4) prior diagnoses of mental disorder in general, and 5) familial abuse, mental illness and stability. (Briere, 2004; McNally et al., 2003; Ozer, Best, Lipsey, & Weiss, 2003; Parslow, Jorm, & Christensen, 2006). Self-reported childhood conduct problems, a history of exposure to family mental illness, being male, being African-American, and a lack of college degree are all related to an increased risk of being trauma exposed. In retrospective studies of post-trauma exposure risk factors, PTSD development correlated with personal or family history of anxiety and mood disorders, physical and sexual childhood abuse, family instability during childhood, and low IQ. In limited prospective studies, school difficulties pre-deployment, lower math skills pre-deployment, and low IQ pre-deployment were all associated with PTSD development risk post-deployment.

Table 1. Demographic, Temperament, and Coping Risk Factors Associated with Increased risk of Development of PTSD by Time Frame.

	Demographic	Temperament	Coping
Risk of Exposure	- Childhood conduct problems - Family mental illness - Being male - Being African-American - Lack of college degree	- High extraversion - High neuroticism	
Post-Exposure: Retrospective	- Anxiety / mood disorder - Family history of anxiety / mood disorder - Physical / sexual childhood abuse - Childhood family instability - Low IQ	High neuroticism	- Low social support - Negative interpretation of others' responses to initial symptoms
Prospective	- School difficulties pre-deployment - Lower math skill pre-deployment - Low IQ pre-deployment	Pre-deployment negativism	
Peritraumatic			- Negative reaction to own initial dissociative reaction - Emotion-focused coping style

Temperament Risk Factors. Clark, Watson, and Mineka, (1994) define neuroticism as a stable tendency to see the world and oneself in a negative way which can confer broad vulnerability to a variety of stress disorders (Costa & McCrae, 1992). For example, Ehlers and Clark (2000) posit that PTSD does not necessarily develop directly from the traumatic event, but rather from negative interpretations of the traumatic experience. Negative interpretations of normal reactions to trauma and the internalization of these negative reactions can also impede an individual's ability to successfully recover from traumatic experience (van de Hout & Engelhard, 2004). In short, neuroticism contributes to negative interpretations which seem to play a causal role in the development of PTSD as well contribute to the severity of its symptoms.

An abundance of research on the relationship between neuroticism and PTSD has generated information concerning various types of traumas, relative susceptibility of distinct

types of individuals, and the importance of time frames in measurement. Elevated levels of neuroticism have been significantly associated with the development and symptomatology of PTSD among victims of both natural and technological disasters (Chung, Dennis, & Easthope, 2005; McFarlane, 1988). Bramsen, Dirkzwager, and van der Ploeg (2000) found that pre-deployment neuroticism scores of peacekeepers significantly predicted PTSD symptoms post-deployment. Several studies indicate that Vietnam veterans diagnosed with combat-related PTSD tend to be more neurotic than those who never developed PTSD (O'Toole, Marshall, Schureck, & Dobson, 1998; Talbert, Braswell, Albrecht, Hyer & Boudewyns, 1993). Elevated neuroticism scores have also been associated with women who have experienced pregnancy loss (van den Hout & Engelhard, 2004; Engelhard, van den Hout, & Schouten, 2006), emergency personnel after working in traumatic environments (Weiss, Marmar, Metzler & Ronfeldt, 1995; McFarlane, 1988), and traffic accident victims (Holeva & Tarrier, 2001). In addition, neuroticism was found to predict lifetime diagnosis of PTSD among young adults in urban areas (Breslau, Davis, Andreski & Peterson, 1991). There is also evidence that neuroticism is strongly associated with PTSD diagnosis and symptoms as early as 6 months (Holeva & Tarrier, 2001) and as long as 3 years (McFarlane, 1992) after the traumatic event.

Despite considerable evidence of a link between neuroticism and PTSD, the ability to predict PTSD based on neuroticism is still debated. Much of the controversy surrounding neuroticism as a predictor of PTSD involves interpretation of causality and directionality of the relation in the data; that is, the debate about whether neuroticism predisposes people to develop PTSD, is a psychological consequence of trauma, or the two share common variance with other symptoms. This is attributable to methodology. While the majority of studies investigating the relationship between neuroticism and PTSD have been cross-sectional, thereby allowing only correlational inferences, several opportunities have arisen in which archival data on neuroticism was available for groups of individuals who would later be exposed to trauma. In the spring of 1999 Belgrade, Yugoslavia was subjected to 78 days of air attacks. One or two years prior, 70 students at the University of Belgrade had been administered the Neuroticism-Extraversion-Openness Personality Inventory - Revised (NEO-PI-R; Costa & McCrae, 1992), providing a rare opportunity to obtain pre- and post-trauma data on neuroticism (Knezevic, Opacic, Savic, & Priebe, 2005). Using multiple regression analyses, the inclusion of all five personality variables measured by the NEO-PI-R neuroticism significantly predicted intrusion scores one year after the attacks, but failed to predict avoidance scores.

Parslow et al. (2006) were also able to obtain neuroticism data in a prospective study on the development of PTSD. However, unlike Knezevic and colleagues (2005), Parslow et al. investigated the relationship between neuroticism and screening positive for PTSD, rather than simply the PTSD related symptoms of intrusion and avoidance (2006). Data on the Eysenck Personality Questionnaire – Revised (EPQ-R; Eysenck & Eysenck, 1991) were collected from 2085 adults in Canberra, Australia as part of a longitudinal community-based survey in 1999. In January 2003 a major brushfire occurred just outside Canberra. Elevated neuroticism scores pre-trauma were significantly associated with screening positive for PTSD post-trauma. Even after all risk factors (e.g., demographics, pre-trauma attributes and experiences, fire-related experiences of trauma threat, uncontrollable and controllable traumatic events, and reaction during fire) were entered in a simultaneous negative binomial regression, neuroticism remained significantly associated with positive screening for PTSD. Engelhard and colleagues (2006)

found similar results in a sample of women who had experienced pregnancy loss. One thousand three hundred and thirty-nine participants took the Eysenck Personality Questionnaire in the early stages of pregnancy. Of these women, 126 would later experience a pregnancy loss. Dichotomizing neuroticism into high versus low, the authors found that, for any given level of education, women scoring high on neuroticism were twice as likely to develop PTSD. Women with the highest education level and lowest neuroticism scores had only a 4% risk of developing PTSD. After pregnancy loss, the risk was almost 20 times (73%) greater for those with the lowest education level who also scored high on neuroticism.

A common argument advanced against focusing on neuroticism as a predictor of PTSD is that after exposure to trauma, some studies have found that the strongest "predictor" of PTSD is the type of trauma experienced (Bromet, Sonnega, & Kessler 1998; Kessler, 2000). In other words, those factors which may predispose individuals to PTSD after, say, a near fatal car accident will not be the same as those for individuals exposed to combat. However, in the first study to investigate psychological traits in PTSD using a nationally representative sample, Cox, MacPherson, Enns, and McWilliams (2004) demonstrated that after controlling for type of trauma, neuroticism still significantly differentiated presence versus absence of PTSD for both men and women, suggesting neuroticism's broad potential for predicting PSTD. It is also worth noting that neuroticism remained significant after controlling for other known risk factors of PTSD, such as lifetime history of anxiety and mood disorders.

While the debate over the nature of neuroticism's role in PTSD is likely to continue – especially whether it is a causal factor or psychological consequence of traumatic experience – few experts would argue that the two stand in no relation to one another. Currently, there is ample literature to justify including neuroticism in a pre-deployment COS follow-up services screener such as the DTC Scale.

Coping Style Risk Factors. Coping styles are socio-developmentally acquired ways of thinking, (i.e., cognitive schema, scripts), in response to emotional states, that are believed to mediate an individual's response to stressors (Henry, 2005; Lazarus & Folkman, 1984; Lee & Scragg, 2001). The importance of coping styles is highlighted by the transactional stress-moderation model, which posits that stress is not only induced by exposure to traumatic events, but also mediated by the cognitions and behaviors that follow (Code & Langan-Fox, 2001). In particular, discrete emotional states of shame, guilt, and humiliation are likely outcomes that follow from exposure to traumatic events (Lee & Scragg). Some types of emotional coping following exposure to severe trauma may compound the immediate stress reaction; in particular, self-blaming coping styles that lead to internalization of unpleasant emotions. Thus, with respect to coping strategies used during deployment, a tendency to respond to trauma with shame, and to shame with self-blaming, should be associated with an elevated risk and poor prognosis for stress related disorders (Briere 2004; Massad & Hulsey, 2006; Parslow, et al., 2006). The Compass of Shame Scale (Elison, Lennon & Pulos, 2006) quantifies a self-blame coping strategy with its "attack-self" dimension.

The results of two studies in particular suggest that aspects of the attack-self coping strategy relate to an increased risk of PTSD development. Heinrichs and colleagues (2005) conducted one of the rare prospective studies addressing the relation between personality trait

aspects of the attack-self coping style and PTSD risk. Forty-three firefighters were assessed at regular time intervals (6, 9, 12, and 24 months) for symptoms of PTSD, depression, and anxiety while also completing measures of personality. The authors found that high levels of hostility and low levels of self-efficacy, two aspects of the attack-self coping style, together accounted for 42% of the variance in PTSD symptoms after 24 months. In the first empirical study to explicitly explore the role of shame in PTSD, Leskela, Dieperink, and Thuras (2002) found that shame-proneness was positively correlated with PTSD development. One hundred and seven former Prisoners of War (POWs) completed the Test of Self-Conscious Affect (TOSCA; Tangney, Wagner, & Gramzow, 1989), to assess shame and guilt, and the PTSD Checklist-Military for DSM-IV (PCL; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996) to measure PTSD symptoms. Results indicated that PTSD symptomology increased as self-reported shame increased. We propose that stable, trait-like tendencies predisposing individuals to self-directed hostility in response to shame (i.e., the attack-self coping style) will lead to poor post-trauma outcomes and in turn will make a significant contribution to PTSD; accordingly, a measure of the attack-self coping style is included in construction of the DTCS.

Collectively, certain demographic characteristics, facets of temperament or personality – neuroticism, specifically – and coping style are well-established in the scientific literature as correlates of COSR and PTSD. The DTCS was constructed to measure important COSR-related demographic characteristics, trait neuroticism, and coping styles, ultimately for use as a tool to identify individuals at increased risk for adverse COSRs or PTSD.

Objective

The objective of this project was to determine the psychometric properties, with emphasis on convergent validity, of a brief paper and pencil instrument designed to assess susceptibility to negative consequences of COS: the DTCS. This report presents: 1) initial validation of the DTCS using a convergent validity approach based on comparisons with existing evidence from established measures of neuroticism and coping styles and 2) implications, limitations, and opportunities for future research.

Method

Sample and Apparatus

Subjects. The study utilized two independent samples of participants. Fifty-four Aviation Preflight Indoctrination (API) trainees voluntarily participated in Sample One, and fifty-eight API trainees voluntarily participated in Sample Two.

The DTCS Instrument. (Appendix A). The DTCS is an 80-item self-report pre-deployment paper and pencil measure designed to capture demographic, personality and coping-style data relevant to COSR. Demographic items focus on characteristics established by previous research as relevant to stress response. The Temperament section was designed as a measure of Neuroticism. The Coping section was designed to measure each of four coping styles: Avoidance, Attack-Other, Attack-Self, and Withdrawal.

The NEO-PI-R. The Revised NEO PI-R is a 240-item paper and pencil measure of the Five Factor Model of Personality (Costa & McCrae, 1992). It encompasses Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience as well as six subordinate facets for each factor.

The Compass of Shame Scale (CoSS). The CoSS (Elison et al., 2006) is a 58-item paper and pencil measure of an individual's use of the four shame coping styles described by Nathanson (1992): Attack-Self, Withdrawal, Attack-Other, and Avoidance. Participants read statements concerning hypothetical negative experiences and are presented a list of possible reactions to those situations. For each hypothetical reaction or response, participants rate the likelihood that they would respond in such a way to the given situation.

Experimental Procedures

Both samples completed their respective questionnaires in paper and pencil format. In Sample One, participants completed the NEO-PI-R and the DTCS. In Sample Two, participants completed the CoSS and the DTCS. The study protocol was approved by the Naval Aerospace Medical Research Laboratory Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects. Psychometric analyses were performed on data drawn from these two samples. Statistical procedures and results are summarized for each sample in the results and discussion section.

Results and Discussion

Sample One: DTCS and Personality

The primary objective of analyses using data from this sample was to examine patterns of correlations among the DTCS dimensions and existing measures of the NEO-PI-R personality traits and their facets: neuroticism (angry hostility, anxiety, depression, impulsiveness, self consciousness, and vulnerability), extraversion (activity, assertiveness, excitement seeking, gregariousness, positive emotion, and warmth), openness (actions, aesthetics, fantasy, feelings, ideas, and values), conscientiousness (achievement striving, competence, deliberation, dutifulness, order, and self discipline), and agreeableness (altruism, compliance, modesty, straightforwardness, tender mindedness, and trust). To ensure a clear pattern of relationships between the NEO-PI-R dimensions and the DTCS, an initial set of analyses including descriptive statistics, factor analysis, and reliability analysis was conducted. Consideration was given to each of the DTCS component scales (i.e., demographics, temperament, and coping styles) separately to check basic statistical assumptions, examine factor structure, and ensure maximum internal consistency.

Psychometric properties of DTCS. The 15 demographic items from the DTCS were examined using a principal components analysis (PCA) with varimax rotation. Initial eigenvalues indicated that the first three factors explained 20%, 13%, and 10% of the variance respectively. The fourth, fifth, and sixth factors had eigenvalues just over 1 and explained a negligible amount of variance. Due to an insufficient number of primary loadings and the leveling off of eigenvalues on the scree plot, a one-factor solution was found to be more

interpretable in comparison to a three-factor solution. The results of the PCA provided evidence for a further examination of the items in order to identify and compute composite scores for the factors underlying the DTCS.

In order to identify the items that were most indicative of a one-factor solution, a reliability analysis was conducted. First, all the items in the Demographics portion of the DTCS were included and Cronbach's alpha of $\alpha = .60$ was obtained. Next, items with corrected item-total correlations that were low enough to reduce the overall scale reliability were iteratively removed, and a new composite demographics scale consisting of 8 items was created. The new scale resulted in an alpha of $\alpha = .70$, which is sufficient according to Nunnally (1978). The items are listed in Appendix A.

Second, the 22 Temperament items from the DTCS were examined. Using the same method as before (i.e., a factor analysis followed by a reliability analysis) a new composite temperament scale was created. The initial eigenvalues indicated that the first three factors explained 33%, 15%, and 8% of the variance respectively. After evaluating the primary loadings and scree plot, it was determined that a one factor solution was the most interpretable.

Following the same process, a reliability analysis of the full Temperament scale was conducted and an alpha of $\alpha = .58$ was obtained. Using the factor analytic evidence as a guide, we iteratively removed items with low corrected item-total correlations to produce a maximally reliable Temperament composite. This new 7 item scale resulted in an alpha of $\alpha = .92$ and is listed in Appendix B.

Next, a reliability analysis was conducted for each of the four Coping scales. Adequate estimates of reliability were obtained with alphas of .78, .70, .73, and .79 for Avoid, Attack-Other, Attack-Self, and Withdraw, respectively. Because adequate reliabilities were observed for each of these scales, no attempt was made to reduce each scale to a core set of items that positively contributed to the internal consistency of the scale. Therefore, we produced scale scores using all of the items for each scale, rekeying negatively keyed items and averaging across items to produce a composite for each scale.

A correlation matrix among the DTCS components – the maximally reliable demographic and temperament composites and the four coping scales – is shown in Table 2. Results indicate that the demographic and temperament composites are relatively uncorrelated with each other and the coping scales. Surprisingly, a negative correlation was found between the temperament composite and the attack-self coping scale. Additionally, it is notable that the four coping styles were positively correlated with each other, with three of the six correlations greater than .70. This indicates substantial overlap between the coping dimensions and hints at the possibility of a single latent factor reflecting maladaptive coping that underlies all four scales.

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Table 2. Correlations among Demographic, Temperament, and Coping Scale Scores.

		1	2	3	4	5	6
1	Demographics composite	-					
2	Temperament composite	-0.12	-				
3	Avoid coping	-0.08	-0.20	-			
4	Attack Other coping	-0.04	0.08	0.72 **	-		
5	Attack Self coping	-0.04	-0.38 **	0.33 *	0.42 **	-	
6	Withdraw coping	-0.03	0.03	0.70 **	0.76 **	0.52 **	-

** $p < .01$, * $p < .05$

Relationships between DTCS and NEO-PI-R scales. The convergent validity of the DTCS was assessed by examining the relationships between the DTCS component scores and the personality variables assessed by the NEO-PI-R, focusing on the relationship between neuroticism and the temperament component of the DTCS. Results indicate that there is no significant relationship between neuroticism and the temperament component. In light of this, non-predicted relationships between other NEO-PI-R facets and DTCS components were also examined. First, raw zero-order correlations between basic demographic variables (age, ethnicity, education, and gender), the NEO-PI-R factors and facets, and each DTCS component scales were conducted, and significant relationships were identified for use in subsequent regression analyses.

Table 3. Correlations among DTCS, NEO-PI-R, and Demographic Items

	Demographics Composite	Temperament composite	Avoid coping	Attack Other coping	Attack Self coping	Withdraw coping
Age	0.10	0.17	-0.08	-0.02	-0.17	-0.13
Ethnicity	-0.15	-0.04	0.13	0.24	0.19	0.17
Education	-0.10	0.05	0.11	0.12	-0.13	0.01
Gender	-0.12	0.07	-0.33 *	-0.25	-0.14	-0.19
Agreeableness	-0.30 *	0.11	0.05	0.09	-0.12	-0.12
Altruism	-0.27	0.15	-0.05	-0.02	-0.21	-0.18
Compliance	-0.35 **	0.15	0.01	0.22	0.15	0.05
Modesty	-0.18	-0.08	0.13	0.07	-0.09	-0.13
Straight forwardness	-0.20	0.04	0.04	0.03	-0.26	-0.14
Tender mindedness	-0.27 *	0.07	0.22	0.32 *	0.15	0.18
Trust	-0.13	0.18	-0.11	-0.16	-0.23	-0.28 *
Conscientiousness	0.13	0.23	-0.24	-0.30 *	-0.39 **	-0.37 **
Achievement striving	0.04	0.25	-0.23	-0.33 *	-0.51 **	-0.43 **
Competence	0.05	0.32 *	-0.26	-0.33 *	-0.32 *	-0.33 *
Deliberation	0.12	0.02	-0.08	-0.01	-0.06	-0.03
Dutifulness	0.12	0.17	-0.27 *	-0.30 *	-0.31 *	-0.45 **
Order	0.09	0.13	0.05	-0.07	-0.20	-0.05
Self Discipline	0.17	0.25	-0.36 **	-0.39 **	-0.46 **	-0.50 **
Extraversion	-0.02	-0.02	0.04	-0.10	-0.13	-0.21

** $p < .01$, * $p < .05$

	Demographics Composite	Temperament composite	Avoid coping	Attack Other coping	Attack Self coping	Withdraw coping
Activity	0.09	0.14	-0.02	-0.19	-0.24	-0.14
Assertiveness	0.17	0.15	-0.38 **	-0.49 **	-0.29 *	-0.41 **
Excitement seeking	-0.14	-0.07	0.08	-0.15	-0.11	-0.18
Gregariousness	0.04	-0.17	0.14	0.04	0.00	-0.08
Positive Emotion	-0.12	-0.09	0.23	0.24	0.09	0.06
Warmth	-0.14	0.00	0.08	0.08	-0.01	-0.13
Neuroticism	-0.06	-0.13	0.55 **	0.60 **	0.36 **	0.66 **
Angry Hostility	0.07	-0.06	0.29 *	0.24	0.07	0.41 **
Anxiety	-0.05	-0.21	0.37 **	0.46 **	0.33 *	0.43 **
Depression	-0.07	-0.12	0.56 **	0.65 **	0.42 **	0.71 **
Impulsiveness	-0.02	-0.03	0.28 *	0.16	0.09	0.30 *
Self Consciousness	-0.10	-0.02	0.52 **	0.63 **	0.40 **	0.58 **
Vulnerability	-0.08	-0.19	0.43 **	0.56 **	0.32 *	0.54 **
Openness	0.08	0.02	0.08	0.21	0.16	0.07
Actions	-0.17	-0.07	0.00	-0.06	-0.10	-0.18
Aesthetics	0.11	-0.10	0.15	0.26	0.26	0.14
Fantasy	0.08	0.14	0.13	0.38 **	0.29 *	0.29 *
Feelings	-0.05	0.13	0.23	0.31 *	-0.07	0.12
Ideas	0.10	-0.02	-0.20	-0.23	0.10	-0.19
Values	0.12	-0.01	-0.09	-0.05	-0.10	-0.07

** $p < .01$, * $p < .05$

We then constructed a separate regression model for each of the DTCS components, including NEO-PI-R dimensions as predictors and one of the DTCS components as the criterion. For each model, we included all of the NEO-PI-R facets that had significant correlations with the relevant DTCS component as predictors. However, given that many of the NEO-PI-R facets were correlated with other facets of the same factor, redundancy among facets produced a high degree of multicollinearity within each model. Thus, we tested progressively restrictive models, excluding NEO-PI-R facets with high variance inflation factors and nonsignificant regression coefficients. The final regression models represent the most parsimonious versions of the initial models and only include facets with low inter-correlations. In most cases, each of the facets included in the final model represent different factors. The models for each of the DTCS components are provided below.

Temperament composite. As previously stated, the Temperament composite showed no reliable relations with the neuroticism facets of the NEO-PI-R, the facet upon which it is theoretically built. Given that the content of the items included in the Temperament composite were designed to capture the same behaviors as many of the neuroticism facets (e.g., impulsiveness, depression, anxiety), this result necessitates examination of relations with the other NEO-PI-R facets in order to inform future research. The only NEO-PI-R facet reliably associated with the Temperament composite was the competence facet of conscientiousness [$\beta =$ .32, t (52) = 2.45, $p < .05$]. Competence accounted for 10% of the variance in scores on the Temperament composite [$R^2 = .10$, F (1, 52) = 6.01, $p < .05$]. Unstandardized regression coefficients for the final model are: Temperament composite = 1.23 +.48 (Competence). This counterintuitive result indicates that individuals with high levels of competence tend to have a maladaptive temperament. This may reflect a chance result, given the relatively small sample, and the fact that no other conscientiousness facets were reliably associated with the Temperament composite.

Demographics composite. The final regression model using the Demographics composite of the DTC as the criterion included the compliance facet of agreeableness as the sole predictor [$\beta = -.35$, $t(52) = -2.68$, $p < .01$]. Compliance accounted for 12% of the variance in scores on the demographics composite [$R^2 = .12$, $F(1, 52) = 7.16$, $p < .01$]. Unstandardized regression coefficients for the final model are: Demographics composite = 0.77 - 0.16 (Compliance). These results indicate that individuals with low levels of compliance tend to experience negative life history events that may, in turn, be associated with PTSD. An alternate interpretation is that experience of such negative events cause individuals to adopt a coping style characterized by low compliance.

Avoidance coping style. The final regression model using the Avoidance coping style dimension of the DTCS as the criterion included gender [$\beta = -.26$, $t(51) = -2.33$, $p < .05$] and the depression facet of neuroticism as predictors [$\beta = .53$, $t(51) = 4.80$, $p < .05$]. These predictors accounted for 38% of the variance in scores on the Avoidance coping style component [$R^2 = .38$, $F(2, 52) = 15.92$, $p < .01$]. Unstandardized regression coefficients for the final model are: Avoidance Coping = 1.74 - 0.35 (Gender) + 0.47 (Depression). These results indicate that females and individuals with high levels of depression are prone to an avoidance coping style. A post-hoc, one-way ANOVA showed that females had significantly higher scores on the Avoidance coping style scale ($M = 2.58$, $SD = 0.37$) relative to males [$M = 2.14$, $SD = 0.50$, F (1, 52) = 6.22, $p < .05$]. No reliable gender x depression interaction was found.

Attack-Other coping style. The final regression model using the Attack-other coping style dimension of the DTCS as the criterion included the assertiveness facet of extraversion [β = -.32, $t(50)$ = -3.15, $p < .01$], the depression facet of neuroticism [β = .46, $t(50)$ = 4.39, $p < .01$], and the fantasy facet of openness [β = .32, $t(50)$ = 3.33, $p < .01$] as predictors. These predictors accounted for 58% of the variance in scores on the Attack-other coping style component [R^2 = .58, $F(3, 50)$ = 22.72, $p < .01$]. Unstandardized regression coefficients for the final model are: Attack-Other Coping = 1.16 - 0.23 (Assertiveness) + 0.35 (Depression) + 0.21 (Fantasy). These results indicate that individuals with low levels of assertiveness who are prone to depression and fantasy have a tendency to adopt an attack-other coping style.

Attack-Self coping style. The final regression model using the Attack-self coping style dimension of the DTCS as the criterion included the temperament composite of the DTCS [β = -.32, $t(50)$ = -2.78, $p < .01$], the achievement striving facet of conscientiousness [β = -.38, $t(50)$ = -3.29, $p < .01$], and the fantasy facet of openness [β = .27, $t(50)$ = 2.37, $p < .05$] as predictors. These predictors accounted for 39% of the variance in scores on the Attack-self coping style component [R^2 = .39, $F(3, 50)$ = 10.87, $p < .01$]. Unstandardized regression coefficients for the final model are: Attack-Self Coping = 3.18 - 0.21 (Temperament Composite) - 0.32 (Achievement Striving) + 0.17 (Fantasy). These results indicate that individuals with low levels of achievement striving, high proneness to fantasy, but – surprisingly – who score low on the Temperament component of the DTCS (high scores on this component indicate maladaptive temperament) tend to adopt an attack-self coping style.

Withdrawal coping style. The final regression model using the Withdrawal coping style dimension of the DTCS as the criterion included the trust facet of openness [β = -.13, $t(49)$ = -1.36, $p = .18$], the assertiveness facet of extraversion [β = -.19, $t(49)$ = -1.77, $p = .08$], the depression facet of neuroticism [β = .57, $t(49)$ = 5.15, $p < .01$], and the fantasy facet of openness [β = .19, $t(49)$ = 1.99, $p < .05$] as predictors. Although trust and assertiveness were not statistically significant predictors, their combined inclusion into the final model significantly increased the model R^2 value. The final set of predictors accounted for 57% of the variance in scores on the Withdrawal coping style component [R^2 = .57, $F(4, 49)$ = 16.26, $p < .01$]. Unstandardized regression coefficients for the final model are: Withdrawal coping = 1.14 - 0.09 (Trust) - 0.14 (Assertiveness) + 0.47 (Depression) + 0.14 (Fantasy). These results indicate that individuals with low levels of trust and assertiveness but high levels of depression and fantasy tend to adopt a withdrawal coping style.

Sample 2: DTCS and CoSS

We further explored the convergent validity of the DTCS in this second sample by examining correlations between the DTCS and CoSS. The CoSS includes the same four coping scales as the DTCS, plus an additional adaptive coping scale. First, we assessed internal consistency of both sets of scales. Results indicated adequate reliability levels for the five CoSS coping scales (α = .70, .77, .88, .89, and .83 for the Avoid, Attack-Other, Attack-Self, Withdraw, and Adaptive coping scales, respectively). Adequate reliability levels were observed also for three of the four DTCS coping scales (α = .73, .84, and .86 for the Attack-Other, Attack-Self, and Withdraw coping scales, respectively). Reliability for the Avoid coping scale was lower than adequate (α = .50). Thus, we performed the same scale reduction analysis described above

to identify the subset of items that maximize reliability, resulting in an increased Cronbach's alpha of $\alpha = .64$. The resulting four items were used to form a new composite for the DTCS Avoid coping scale, listed in Appendix C.

We then produced a correlation matrix to examine the relationship between each DTCS and its respective CoSS scale. Results indicate that three of the four DTCS coping scales had significant, positive correlations with their respective CoSS scales. The DTCS Avoid coping scale had consistently low correlations with all dimensions. However, the new composite had a stronger, though still non-significant correlation with its CoSS counterpart compared to the full version of the scale (.18 versus .09).

Table 4. Correlation between DTC and CoSS Coping Scales

	DTCS - Attack Self	DTCS - Attack Other	DTCS - Avoid	DTCS - Avoid (Revised)	DTCS - Withdraw
CoSS - Attack Self	**0.67** **	0.50 **	-0.06 -	-0.06 -	0.67 **
CoSS - Attack Other	0.39 **	**0.80** **	0.12 -	0.20 -	0.33 *
CoSS - Avoid	0.49 **	0.50 **	**0.09** -	**0.18** -	0.33 *
CoSS - Withdraw	0.54 **	0.65 **	0.03 -	0.06 -	**0.67** **
CoSS - Adapt	-0.17 -	-0.05 -	0.08 -	-0.03 -	-0.26 *

** p < .01, * p < .05

General Discussion

Implications
Our results present a mixed picture for inferring the nomological network, and therefore application, of the DTCS. The coping dimensions of the DTCS had consistent and interpretable relationships with facet scales of the neuroticism, extraversion, and openness dimensions of the NEO-PI-R. Most notably, significant relationships were observed between all of the neuroticism facets (and most consistently with the depression facet of neuroticism) and the assertiveness facet of extraversion, and between neuroticism and the fantasy facet of openness. Additionally, the coping scales had an interpretable pattern of relationships with a closely related measure of the same dimensions (the CoSS). These relationships depended, to some extent, on the reliability of the scales, which was observed to be adequate, though low, for all scales in one sample and problematic for only one scale (Avoid coping style) in a second sample. These results suggest a positive first step in establishing the convergent validity of the DTCS Coping component.

Limitations

Unfortunately, the DTCS Demographics and Temperament composites did not show consistent relationships with the relevant NEO-PI-R factors nor with either coping scale. It is unclear whether this should be expected for the demographics component. Although previous research shows demographic variables and neuroticism each to be predictive of COSRs and PTSD, it is not clear whether they exhibit shared predictive variance. However, the lack of convergent validity evidence for the Temperament component of DCTS vis-à-vis NEO-PI-R neuroticism was unexpected, considering that DCTS Temperament was developed specifically as a measure of neuroticism. Without other sources to establish convergence or divergence, we can only conclude that the temperament component of the DTCS does not currently capture neuroticism. Comparison with other scales in the DTCS's theoretical nomological set is needed to better delineate what the temperament component is capturing.

Future Research

Due to the relatively small samples available for this study, further psychometric analysis and convergent validation with larger samples is needed to verify these initial results. Use of the DTCS in its current form is not recommended, though the potential impact of an instrument of this type warrants further investigation. The results of this initial validation can be used as a guide in future attempts to develop an effective COS follow-up services screener.

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Disclaimer

The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.

Human Research Protections/IRB Statement

The study protocol was approved by the Naval Aerospace Medical Research Laboratory Review Board in compliance with all applicable Federal regulations governing the protection of human subjects.

Sources of Support

Copyright Statement

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Appendix A. The DTCS

Appendix B. Maximally reliable demographics scale items

1. I have experienced a parent who had a problem with drugs or alcohol.

2. In the past, I have witnessed someone being assaulted or violently killed.

3. In the past, I have been robbed or had my home broken into.

4. In the past, I have lost my job.

5. In the past, I have been emotionally mistreated (for example, shamed, embarrassed, ignored, or repeatedly told I was no good).

6. In the past, I have seen or heard physical fighting between my parents or caregivers

7. In the past, I have been physically punished by a parent or caregiver.

8. In the past, I have been physically injured by another person (for example hit, kicked, beaten up).

Appendix C. Maximally reliable temperament scale items

1.   How often are you stressed?

2.   How often are you in a good mood?

3.   How often are you confident?

4.   How often are you embarrassed?

5.   How often do you resist temptation?

6.   How often are you calm when things go wrong?

7.   How often are you uncomfortable speaking in front of people?

Appendix D. Maximally reliable avoid coping scale items

1.   When my physical fitness scores are worse than expected, I do not care.

2.   When I get a poor performance evaluation, I think it doesn't matter.

3.   When I apply for something and get rejected, I think it is no big deal.

4.   When people count on me and I disappoint them, I blow it off.